NAS 1.46:16/5 DOCUMENTS

NASA Activities

National
Aeronautics and
Space
Administration

May 1985
Vol. 16, No. 5

LIBRARY
EASTERN MICHIGAN UNIVERSITY
YPSILANTI
U. S. DEPOSITORY DOCUMENT

JUL 15 1985

About The Cover

NASA's fourth operational Space Shuttle Orbiter, Atlantis, fresh out of the Shuttle Assembly Facility at NASA's Ames-Dryden Flight Research Facility in Edwards, California, prepares to be piggy-backed to the Kennedy Space Center in Florida by NASA's modified 747 jumbo jet. Officially designed OV-104, Atlantis completes the currently authorized fleet of Shuttle Orbiters.

Named after a two-masted sailing vessel operated for the Woods Hole Oceanographic Institute, located in Woods Hole, Massachusetts, Atlantis has been outfitted with special alterations. These include structural modifications to the wings and body, payload bay plumbing and necessary umbilical connections for cryogenic servicing of the Centaur upper stage. These connections are crucial to the scheduled Galileo and Ulysses missions in 1986.

Atlantis without mission payloads, equipment, and fuel, weighs approximately 169,800 pounds. Its thermal protection system consists of more than 24,000 tiles, nearly 1300 thermal protection blankets, and coated Nomex felt surface insulation.

The Space Shuttle fleet which now includes Columbia, Challenger, Discovery, and Atlantis, exemplies our nations superior technology to meet that last great frontier of space.

Contents

Administrator's Column	3
Laser System Developed to Clean Clogged Arteries	5
Space Probe Nears Rendezvous to Comet	6
ATS-1 Ends 18 Years of Service	7
STS Manager Announces Departure	8
From the Science Advisor—Major Goals for Aeronautics	9
New Life for Miss Liberty	10
National Commission on Space Named	11
NASA Mathematician Presented High Honors	11
The Water Hyacinth Has a New Image	12
Industry and Government	13
Space Station Agreement Signed with Canada	14
NASA Inventors of the Year Announced	14
Report Cites Need for Automation in Space Station	15
Evidence Found Supporting Mineral Origin of Life Theory	16
Gas Cloud Surrounds Possible Protoplanetary System	16
Aerospace Research Aid Developed by NASA	17
Contractor News	18
Did You Know?	18
Shuttle Launches for 1985	19
Another Dividend from Air and Space	20

NASA Activities is published monthly by the National Aeronautics and Space Administration for the information of the agency's employees. Contributions and recommendations are solicited from Headquarters and field centers, and should be addressed tc Editor, NASA Activities, News and Information Branch, Code LFD-2, Washington, D.C. 20546. Material submitted for publication cannot be returned.

Distributed free of charge only to current agency employees. Available by subscription from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Check or money order should be made payable to Superintendent of Documents, GPO. Subscription rates are $23.00/year, domestic; $28.75/year, foreign.

Dwayne C. Brown
Editor, Code LFD-2
NASA Headquarters
Washington, D.C. 20546
Phone: (202) 453-8400

NAS 1.46:16/5

Administrator's Column

(In this column NASA Activities features an article by NASA Administrator James M. Beggs. These articles focus on subjects chosen by him that address topics of broad interest to the agency's employees. The column this month features an address presented at NASA's Marshall Space Flight Center, Huntsville, Alabama.)

Quality Improvement and Greater Productivity

We are nearing the end of what was once called "The American Century." During most of the century, the United States' economic preeminence in the world seemed assured. And, as recently as 2 decades ago, that, indeed, appeared to be true.

But centuries, like light bulbs, do not seem to last as long as they once did. In recent years, we have learned that for the rest of the American century and beyond, our economic leadership is by no means assured. In an incredibly few years, while most of us fell asleep at the wheel, others were wide awake. They took our technology and moved it into marketable products faster than we could. And when we finally opened our eyes, others had passed us by — in areas we once considered our own special domain.

One by one, basic industries and manufacturing industries began to feel the lash of foreign competition. Today, scores of American industries, ranging from steel to electronics, are fighting hard to stay alive.

And even as we strive to return America to excellence and to the competitive position we enjoyed just a few years ago, other symptoms of our competitive decline are all around us.

The record United States trade deficit for 1984, more than $123 billion, is but one symptom of the problem.

Trade accounts for a critical share of our GNP. It is true that the high value of the dollar in currency exchange markets has helped to erode the markets for American-made goods. But that still does not fully account for the fact the import share of our domestic market for manufactured goods is growing. In 1982, for example, imports won 14 percent of the domestic market. Last year that grew to 22 percent.

Though we still lead our competitors in high technology exports — things like business machines, scientific equipment and electronic machinery — our companies are maintaining their sales abroad at the cost of dwindling profitability. Many industries are considering building plants abroad so they might compete on a more equal footing with their foreign competitors. This would mean a loss of jobs in the United States, a development we could ill afford.

There are other symptoms of our competitive decline. Since the mid-1960s, our investment in research and development in proportion to our GNP has dropped sharply, while that of other major industralized nations has increased.

And we lag behind our competitors in turning out scientists and engineers, professionals crucial to technological progress. Engineering and science account for only 20 percent of all bachelors' degrees earned in the United States. This compares with 25 percent of all such degrees in Japan; 34 percent in West Germany and more than 50 percent in the Soviet Union.

But the real keystone of economic vitality is productivity growth. Here our annual growth rates, while advancing at about 3 percent, still do not measure up to Japan's 6 percent, for example, or to West Germany's 4.5 percent or to France's 4 percent. Unless we can maintain a productivity growth rate that is competitive worldwide for the long term, we will continue to lose ground to others in world markets.

Ironically, just at a time when consumer confidence and economic growth appear to be on the upswing, we find ourselves faced with a new and growing problem: the gnawing prospect of an uncertain future, based on the decline of America's competitive position in the world.

If we don't put our economic house in order today, we could face growing unemployment and lower standards tomorrow.

Clearly, improvements in productivity and quality are fundamental ingredients in helping to reinvigorate America's competitive strength.

This is a nationwide challenge. A couple of years ago we decided that NASA has a special role in helping to meet it, because for most Americans, NASA epitomizes excellence. This was brought home to me the other day when I saw an ad in the paper. The headline read: "Can you choose the copier NASA chose?" The question was followed by an array of well-known names and some relatively not-so-well-known. It concluded by urging consumers to "copy NASA" if they want the best copier for their money.

LIBRARY
EASTERN MICHIGAN UNIVERSITY
YPSILANTI
U. S. DEPOSITORY DOCUMENT

The ad did not surprise me. Indeed, for years NASA has stood for what is best about America — creativity, innovation, and a can-do spirit that demonstrates that nothing is impossible if we apply will, resolution and resources to accomplish great things. So, we decided that NASA would help get America back on the competitive track by spearheading a drive to restore national excellence through improvements in quality and productivity.

We thought the best way to do this was to try to set an example to the rest of government and to our industry and university partners by establishing our own productivity and quality improvement program.

Mark Twain once wrote, "Few things are harder to put up with than the annoyance of a good example."

Looking at it *that* way, we'll be very pleased if our program becomes a major national annoyance. And if it does, we will be proud to take the credit for helping to get American industry on the winning track again.

What we are doing reaches into every corner of the agency, and also reaches out to other government agencies and industry. Last September, with the help of the American Institute for Aeronautics and Astronautics, we held a 2-day national symposium in Washington on developing strategies for improving productivity and quality in government and industry. More than 600 government and business leaders attended. The numbers in attendence and the lively discussions convinced us that people are very concerned about these matters and are ready and willing to work at them.

We began our program 3 years ago, when we formed an executive management team to study what industry was doing to improve productivity and quality. The team visited three companies known for their innovative management practices in these areas: Westinghouse, TRW and Hewlett Packard.

Not surprisingly, we found that the three companies shared a basic management philosophy.

That philosophy reflects the notions of participative democracy. It is based on respect for the individual and a belief that decentralized decision-making and the team approach to problem-solving encourage innovation and reveal talent which otherwise might go unnoticed.

We thought this was a good and effective philosophy, so we made it our own. Our goal became to motivate all NASA and contractor employees, from top managers on down, to participate in improving overall agency performance. Our objective — to make every employee feel that he or she has a stake in making the system work better. Because only through participation across the board can we achieve higher quality products and greater individual and institutional pride in what we do.

In house, we have established our own version of industry Quality Circles, the concept pioneered in Japan by Dr. W. Edwards Deming and other Americans. We call our groups NETS for NASA Employee Teams. There are now 120 NETS throughout the agency, including some with contractor members. All NETS members are volunteers and the teams are composed of all classes of employees, including secretaries, blue collar workers, scientists and engineers. If any of you are involved in a NET, you know it is very democratic and that this voluntary approach to problem-solving can also be very effective.

Another tool to increase employee participation is our Employee Suggestion Program. Eleven months ago, we began a drive to revitalize the program, which had fallen into disuse after its heyday during the Apollo Program and was practically moribund by 1982.

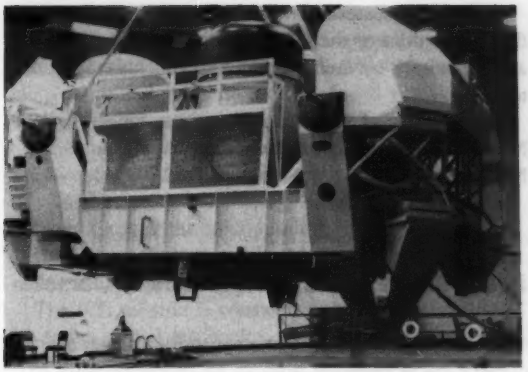
We have had extremely good results in bringing it back to life. For example, during FY 1984, we received 1,095 employee suggestions, with tangible benefits to NASA totaling more than $3.5 million. This is 64 percent more than the 396 suggestions we got in fiscal year 1983, which resulted in savings of a little over half a million dollars.

On another front, we have been reducing unnecessary bureaucracy by cutting paperwork, decentralizing decision-making by delegating more authority to the Centers, and installing state-of-the-art office automation. These efforts have been very fruitful, resulting in administrative time-savings in the lead time for procurements, a 20 percent cut in the agency-wide paperwork load, and significant time and effort saved in program planning and budget preparation.

Throughout the agency, 90 cents of every dollar we spend is spent in the private sector. So our contractors have, of course, been brought into this effort.

We have established a NASA-Contractor Productivity Council to zero in on the NASA-Contractor relationship and to study ways we can reduce or eliminate obstacles to productivity and quality improvement. Participation in the Council has been very encouraging. More than 200 people from industry and our centers met last April to discuss areas of emphasis. And they plan to meet again to review progress.

We are very serious about our Contractor Council's work. To make it easier for contractors to do their job, we look to them for suggestions on how the contract should be structured. We are looking at potential incentives on quality and productivity that fit a particular company. And we have already changed some of our contracts to reward improvements in those areas.



A full scale model of GRO is prepared for testing.

The contract we have with TRW on the Gamma Ray Observatory program is a good example. A joint TRW-NASA product improvement program began in July 1983. It has resulted in projected savings of more than $2 million to date. They came to us and asked us to write a productivity incentive clause in their contract, which we did. And they are doing a good job on it. Right now, they are ahead of schedule and under budget. And if they stay that way, they will get a reward. If they don't, they will accept the penalty.

We are also developing another incentive, the NASA Excellence Award for Productivity and Quality, to recognize outstanding achievements by our contractors, subcontractors and suppliers. It will be self-nominating, and won't be limited to only one company a year. Under it, every employee in the plant, from top managers on down, will be recognized.

I can tell you that it will be very difficult to pick the winners. We have had a slew of excellent nominees for the first awards, which will be in January 1986.

We also are working on ways to bring the university community into this entire effort, and hope to do so soon.

The success of NASA's programs is well-documented. But, as Shakespeare once wrote: "No perfection is so absolute, that some impurity doth not pollute."

Quality performance is our litmus test. We aim to get rid of shoddy workmanship, defective materials, inadequate quality control, cost overruns and all of the other things that are counter-productive and hurt the program. The Management Development Program here and at our other centers will help us do this. So will our new thrust for quality improvement and greater productivity.

I am confident that we will meet our goals. And when we do, both NASA and the nation will be the winners.

Clearly, we live at a time when the public has grown impatient with government, a time when government officials can no longer afford to be patient with outmoded procedures and shoddy workmanship.

Thomas Jefferson once put it this way: "Laws and institutions must go hand in hand with the progress of the human mind . . . As new discoveries are made, new truths disclosed, and manners and opinions change with the change of circumstances, institutions must advance also, and keep pace with the times."

"Institutions must advance," Jefferson and his associates saw that point clearly in the late 18th century. And the fruit of their vision was a new nation.

It is now for us to match their vision with ours. Our task is to reinvigorate our nation so that we remain at the pinnacle of economic leadership.

Your continuing initiative, dedication and commitment will be crucial to that task.

Laser System Developed to Clean Clogged Arteries

NASA scientists have adopted a laser originally designed to measure gases in the atmosphere to the task of cleaning out clogged arteries without harming the walls of the blood vessels. The technique, when perfected, could allow patients to avoid coronary bypass surgery.

Physicians at Los Angeles' Cedars-Sinai Medical Center and laser scientists at NASA's Jet Propulsion Laboratory in Pasadena, Calif., recently teamed together to develop a laser system designed to non-surgically clean clogged arteries with unprecedented precision.

The system, called the excimer laser, someday may allow patients with arteriosclerosis to avoid coronary bypass surgery.

The excimer laser originally was developed at JPL to measure gases such as ozone in the Earth's atmosphere. Investigations into its application to medicine began a year and a half ago when Cedars-Sinai physicians Warren Grundfest, Frank Litvack and James Forrester, conducting research into the potential of lasers in cardiology, sought a more precise and cooler laser than those currently available for use in medicine.

They found such a laser in the form of the excimer, developed by a JPL laser research team of Drs. James Laudenslager, Thomas Pacala, Stuart McDermid and David Rider. Working with the Cedars-Sinai physicians and a fiber optics consultant, Dr. Tsvi Goldenberg, the JPL team refined the laser for the delicate cardiovascular

cleaning procedure devised by the medical researchers.

Lasers are used in many medical applications where precision cutting or welding is required, but have not been used with much success for the treatment of cardiovascular disease. Laser energy, if misdirected, can easily perforate delicate arterial walls and when plaque is burned away with most lasers, a rough, singed surface is left that tends to reaccumulate new plaque.

Laser energy can be used to heat matter, to illuminate it or to produce kinetic energy that breaks the molecular bonds of the material. The objective is to remove the plaque, not to heat.

Tissue cells can withstand heat up to 154 degrees Fahrenheit. Tissue near the plaque irradiated by the pulsed excimer laser tests never reached temperatures higher than 149 degrees F., so there is no danger of burning or singing artery walls.

This represents a vast improvement over other lasers used experimentally in laser-cardiology techniques, which heated tissue local to the irradiated area to temperatures ranging from 428 to 500 degrees.

Using a new technology of glass magnetic switches patented by JPL, the xenon-chloride excimer laser can be made to produce a uniform beam of energy that can be controlled and pulsed in an extremely short period from 10 billionths of a second to 200 billionths of a second (compared with hundredths of a second for other medical lasers).

One pulse of the excimer laser cuts away microns of plaque with great precision reducing the danger of perforation.

The procedure involves threading a 1.5 millimeter diameter catheter through coronary arteries. The laser light is carried through one of three bundles of fibers within the bendable catheter. Another group of fibers shines a light at the tip of the catheter. A third fiber bundle within the catheter has a lens at its tip to provide video pictures of the inside of the artery. Clear liquid is flushed through the catheter to push back blood for a clearer picture. Fiber optics consultant Goldenberg developed the tiny fibers needed for the system.

Watching the video picture fed through the fiber optics, the physician can spot areas of plaque build-up and fire short bursts of the excimer laser that vaporize the material. The plaque disintegrates. The process occurs so quickly that the neighboring tissue is spared from damage.

In excimer laser experiments on living laboratory animals, cadavers and on arteries removed from heart patients, a typical coronary blockage has been cleared in 2 minutes.

While the researchers are being properly cautious in their predictions of the laser's medical potential, they are encouraged by the results of experiments carried out to date.

Development of the excimer laser was funded by NASA's Office of Space Science and Applications, NASA Headquarters, Washington, D.C.

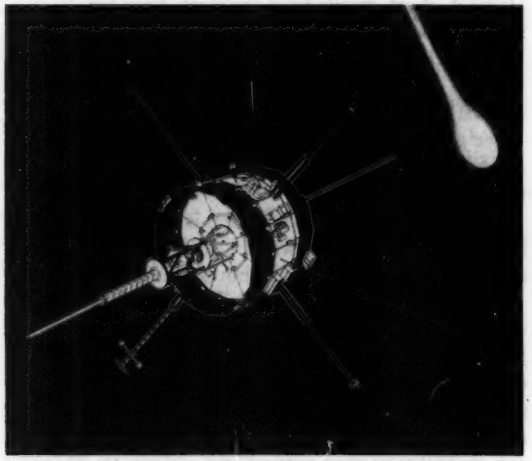
Space Probe Nears Rendezvous to Comet

The first space probe to attempt to fly through a comet's tail is streaking towards an encounter with Comet Giacobini-Zinner this September.

The space probe, the International Cometary Explorer (ICE), is now half the distance to its target. Previously, the spacecraft launched in 1978 was known as the International Sun-Earth Explorer 3 (ISEE-3).

With a delicate series of trim burns, beginning with a major course correction May 16, controllers will refine the space probe's trajectory to intercept the comet as the two bodies close at a relative velocity of 13 statute miles per second.

Rendezvous is a point in the tail about 6,200 statute miles from the comet's head, as near as the space probe dares go without risking damage from cometary debris. If the intercept succeeds, it will provide scientists with their first on-the-spot opportunity ever to study a comet's tail.



Artist concept of ICE leaving comet after rendezvous.

With ICE NASA should get its first direct sampling of the important features of a cometary tail. These features include the magnetic fields which define the tail's shape and the plasma of electrified gases making up its content.

At the same time, scientists will have the chance to see how the tail interacts with the solar wind (the flow of charged particles and energy streaming from the Sun outward through the solar system).

Both areas of study, will complement the multi-national probes to Halley's comet in March 1986.

The ICE mission is considered remarkable because of its daring orbital mechanics, which, among other things, took the spacecraft skimming by the Moon on five different occasions. ICE also has made headlines as one of the world's least expensive space missions.

The spacecraft originally was launched in 1978 to study the Sun-Earth environment by orbiting a libration point in space between the two bodies.

Goddard controllers redirected the spacecraft on a two-part target-of-opportunity mission in 1982: first to study the Earth's geomagnetic tail and now to encounter Comet Giacobini-Zinner. The Goddard Space Flight Center, Greenbelt, Md. has responsibility for project management of the mission.

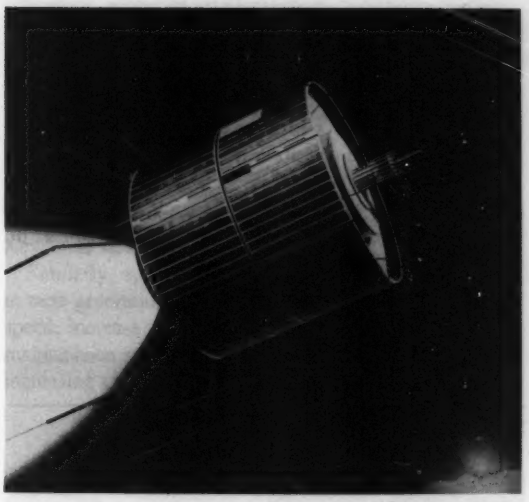
ATS-1 Ends 18 Years of Service

After more than 18 years of service, NASA's first Applications Technology Satellite (ATS-1) failed to respond to commands correcting its eastward drift from geostationary position over the Gilbert Islands in the western Pacific.

Robert O. Wales, ATS project operations director at NASA's Goddard Space Flight Center, Greenbelt, Md., reported that the ground control station at Hawaii no longer can keep ATS-1 at its present location and it will likely drift out of a useful orbital position in the next 4 months.

Launched in December 1966, with an expected lifespan of 3 years, ATS-1 provided voice and data communications capabilities to several information networks in the Pacific basin.

The Pan Pacific Education and Communication Experiments by Satellite (PEACESAT) program, currently the major user of ATS-1 services, effectively will be dissolved with the eventual loss of the satellite. Educational, health, research, technology and community services had been transmitted through ATS-1 to 23 autonomous terminals located in Hawaii,



Artist rendering of ATS-1 before orbit.

Cook Islands, the Mariana and Caroline Islands, Western and American Samoa, the Marshall Islands, Melanesia, New Zealand and Australia.

ATS-1 compiled a notable record of achievements during its lifetime:

- First transmission of full-Earth, cloud cover pictures from geosynchronous orbit — forerunner of the hemispheric weather pictures seen on TV (1967).
- First transmission of real-time television pictures (Apollo 4 splashdown) from the mid-Pacific (1967).
- Two-way communication tests with commercial airliners to determine aircraft orientation effects on satellite communications; a cooperative venture with the Federal Aviation Administration and the airlines (1967-1968).
- Link-up between the U.S. and USSR scientists during an atmospheric, sea and ice condition experiment in the Bering Sea (1971).
- Transmission of electrocardiographs from Hawaii to New Zealand and from Alaska to the University of Washington (1973).
- Presentation of medical conferences over the PEACESAT network consisting of 12 nations and the University of Hawaii (1971-1978).

One of the most unique services provided by ATS-1 was its Alaskan "Doctor Call", praised by the medical world as the first innovative approach to rural medicine in the U.S. Through ATS-1, Public Health Service physicians were able to communicate daily with trained

health aides in the remote Alaskan bush country. The aides had been trained as paramedics for 6 weeks at the Veterans Administration hospital in Fairbanks prior to their "Doctor Call" services in the remote villages.

The loss of ATS-1 will leave one other comparable satellite, ATS-3, in operation. It was launched in November 1967. Positioned in geosynchronous orbit over the Pacific Ocean, south of Mexico, ATS-3 covers the U.S., most of the Atlantic Ocean and a large part of the eastern Pacific, including Hawaii.

STS Manager Announces Departure

Dr. Glynn S. Lunny, National Space Transportation System manager and a member of the Space Task Group which commenced U.S. space flight, announced his intentions to leave NASA. Planning to pursue opportunities outside of government, Lunny has not set an exact date for his departure.

Lunney, whose career almost exactly spans the period of American efforts in space, began his government service with NASA's predecessor, the National Advisory Committee for Aeronautics at the Lewis Research Center in Cleveland in May 1958. From his position there as an aerospace research engineer, he moved to the Space Task Group in September 1959.

When the Space Task Group became the Manned Spacecraft Center, Lunney moved with it to Houston from the Langley Research Center in Hampton, Va. From April 1962 to August 1964 he was Head of the Mission Logic and Computer Hardware Section. In August 1964, he became Chief of the Flight Dynamics Branch and was also appointed as a Flight Director for the Gemini program in the same year that Mission Control began its operations in Houston.

In July 1968, 1 year before the first manned landing on the Moon, Lunney was appointed Chief of the Flight Director's Office, a position he held until March 1972.

At that time, he became Special Assistant to the Manager of the Apollo Spacecraft Program, and then three months later, in June 1972, became Manager for Operations, Experiments and Government Furnished Equipment for the Apollo Spacecraft Program. In March 1973, he became Manager of the Apollo Spacecraft Program. During that period he held a dual role, also acting as Manager of the Apollo-Soyuz Test Project.

In July 1975, Lunney's career changed course towards a new type of space flight with the Space Shuttle. At that time he became Manager of the Shuttle Payload Integration and Development Program, which was redesignated the STS Operations Program in July 1980. In that role, he was responsible for directing the planning and implementation for all payloads and payload carriers to be used in the Shuttle program.

During his tenure as STSOP manager, he was detailed to Headquarters from November 1976 to July 1977 as Deputy Associate Administrator for Space Flight, and from November 1979 to July 1980 as Acting Associate Administrator for Space Transportation Operations.

In 1981, he was appointed to his current position as Manager of the National Space Transportation Systems Program. Responsibilities of the job include overall systems management and integration of all elements of the program. The office is directly responsible for vehicle system engineering, design and integration, including the integration of payloads and payload carriers aboard the Shuttle.

Lunney has earned numerous awards and citations during his career, including the Lawrence Sperry Award, the Arthur S. Fleming Award, the Louis W. Hill Space Transportation Award, the Allan D. Emil Memorial Award, the W. Randolph Lovelace II Award, an honorary doctorate of laws from the University of Scranton, three NASA Group Achievement Awards, two NASA Distinguished Service Medals, an Outstanding Leadership Medal, and Senior Executive Service designations.

He is a member of Pi Tau Sigma, Tau Beta Pi, and has been elected to the rank of fellow in both the American Astronautical Society and the American Institute of Aeronautics and Astronautics.

He was born in Old Forge, Pennsylvania in November 1936 and attended the University of Scranton from 1953 to 1955. He received a bachelor of science degree in aeronautical engineering from the University of Detroit in 1958.

Lunney and his wife, the former Marilyn Jean Kurtz, have four children and reside in Friendswood, Texas.

From the Science Advisor — Major Goals for Aeronautics

The President's Science Advisor, Dr. G. A. Keyworth, II recently released a report of the Aeronautical Policy Review Committee that proposes national goals for research and development in aeronautics. He presented these goals as challenges to the aeronautics community and to focus attention on the importance of sustained American aeronautical leadership.

Keyworth stressed that, in the face of strong and growing challenges from foreign interests, lasting U.S. aeronautical leadership will be maintained only by the vigorous application of our traditional strength — innovative new technology. He added that there are aeronautical opportunities which could make virtually all of today's operational military and civil aircraft obsolete before the end of the century.

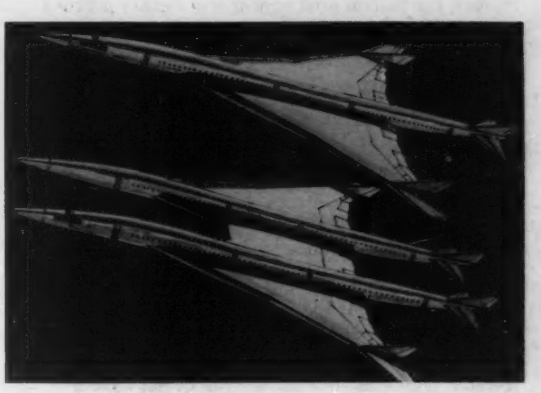
"Only a few years ago there were suggestions that aeronautics was a mature field and that there was little additional improvement in aircraft performance to be gained from continued aeronautical research. But continued R&D can lead to monumental improvements in the performance of aircraft in coming decades," said Keyworth.

"That early study also reaffirmed the government's role in supporting research and technology in aeronautics. From our viewpoint, aero research and technology remains an important investment. Our national interests, in particular our national security interests, dictate continued federal support."

The new goals themselves span the whole flight regime. The first calls for advancement of the technologies applicable to a variety of subsonic aircraft. Research by NASA and industry over the past several years has demonstrated that there's great potential for significant improvements in subsonic aircraft performance. Most of these technologies could be brought to maturity in the 1990s to create the foundation for a new generation of aircraft. These could include short-, medium-, and long-range transports and rotorcraft that incorporate active drag reduction systems, high-speed turboprop engines, all-composite primary structures, high-lift aerodynamic systems, and new flight control and guidance improvements. These and other technologies could result in greatly increased fuel efficiency, access to smaller airports, quieter operations, and in general, greater economy.

"Convincing evidence of the vast potential of these emerging technologies is evident in a recent corporate announcement by Boeing, which has decided to postpone development of a new series of transports until those technologies are available. Boeing apparently is confident that with those new technologies it's going to be able to leapfrog its commercial competitors," Keyworth said.

Similarly, application of these subsonic technologies in next-generation military aircraft could enhance cruise speed, increase payload and range, and reduce maintenance requirements — thus significantly increasing availability and operations flexibility.



Two concepts of future supersonic transports.

"The second goal takes us into the higher-speed regimes of supersonic transports. Although this Administration has made no commitment to supersonic transport, we are laying the groundwork, both in NASA and DOD, in the fundamental technologies essential for any future efforts in supersonic flight. These technologies include supersonic laminar flow control for increased aerodynamic cruise efficiency, major improvements in variable-cycle engine efficiency and noise abatement, and lightweight, high temperature structures. We believe that successfully integrating these improvements could permit 600-passenger transport aircraft with speeds up to Mach 3.2 over ranges of 5500 miles with over three times the fuel efficiency of current supersonic aircraft," continued Keyworth.

The further development of sustained supersonic cruise technologies will improve the survivability, responsiveness, and basing flexibility for our military aircraft.

The third goal looks at capturing the potential payoffs available from super-high-speed flight — hypersonic speeds and transatmospheric vehicles. Envisioned are vehicles that could operate from conventional runways, maneuver at the fringe of the atmosphere, and when required, ascend into space orbit with little additional effort.

Vehicles of this type depend on further technological developments in propulsion, materials and intelligent, integrated flight controls. As an example, hydrogen-fueled scramjets hold great promise in producing substantially improved propulsive efficiency over today's rocket technology. The applications for these transatmospheric vehicles range from regular access to space to point-to-point global transportation.

These national goals have to engage the interest and participation of all parts of the research community. For its part, the federal government will remain a strong supporter of aeronautical research, with particular emphasis in DOD and NASA on research that offers high payoffs. But government can only provide part of the technological base and support to achieve these goals. The private sector is expected to share in the development of new technology and in applying it to new projects.

Early this year the President's Commission on the Industrial Competitiveness concluded that the only certain advantages that U.S. industry has in world competition are superior technology and superior technical talent. That's certainly the case in aeronautics, with its broad industrial base and excellent university research programs. But the U.S. does not have a monopoly on the emerging technological opportunities. Many smaller countries, even developing nations, are anxious to capitalize on new aero technologies. The U.S. must make sure that its national efforts stay at the forefront of new aeronautical knowledge and its practical application.

The report was prepared by the White House Science Office's Aeronautics Policy Review Committee, a group of industry, government, and academic aeronautic experts that was established in 1983.

New Life for Miss Liberty

On October 28, 1886, President Grover Cleveland led a million Americans in the dedication of the Statue of Liberty, a gift from the people of France intended to symbolize American freedoom. This Fourth of July, to commemorate Miss Liberty's 100th anniversary, the statue will be rededicated after extensive renovation and refurbishment.

Corrosion protection is being provided for the interior structure by a primer coating known as K-Zinc 531, an aerospace spinoff product manufactured by Inorganic Coatings, Inc., Malvern, Pennsylvania. The coating was developed by NASA's Goddard Space Flight Center, Greenbelt, Md., as a means of protecting gantries and other structures at NASA's primary launch site, Kennedy Space Center (KSC), Fla.

KSC is located on Florida's Atlantic Coast, thus its launch facilities require greater corrosion protection than is needed inland because of constant exposure to salt spray and fog. Seeking to reduce maintenance costs at KSC, Goddard conducted a research program aimed at development of a superior coating that would not only resist salt corrosion but also protect KSC launch structures from the very hot rocket exhaust and the thermal shock created by rapid temperature changes during the space launch. The successful research effort produced a new type of inorganic coating.

At the time of Goddard's research in the early 1970s, there existed a number of anti-corrosion coatings formulated of zinc or aluminum dust in an organic binder, but they required two or more coats. To counter rising maintenance costs, Goddard sought longer lasting protection with only one coating with a water-based potassium silicate binder, a compound that provides long-term protection with a single application.

In 1981, NASA granted a license for the coating to Shane Associates, Wynnewood, Pennsylvania. The following year, Inorganic Coatings signed an agreement to become sole manufacturer and sales agent under the Shane license. The latter company assigned the trade name K-Zinc 531 to the NASA compound.

Because K-Zinc 531 is water-based, it is non-toxic, non-flammable and has no organic emissions. The high ratio silicate formulation bonds to steel in just 30 minutes and creates a very hard ceramic finish with superior adhesion, and abrasion resistance. It requires no straining before application and can be easily mixed on site. It is also very easy to apply and saves many labor hours per application.

National Commission on Space Named

President Reagan has named a 14-member National Commission on Space to develop civilian space goals for the 21st Century.

The announcement came before the National Space Club, which awarded the prestigious Goddard Memorial Trophy to the President in recognition of his support for the space program.

The commission will be chaired by former NASA Administrator Thomas O. Paine, and also includes astronaut Dr. Kathryn D. Sullivan of the Johnson Space Center, Houston, Texas, the first American woman to walk in space.

Reagan said the panel would "look beyond the short-term steps to develop long-term goals for our national civilian space enterprise," and would "devise an aggressive civilian space agenda to carry America into the 21st Century."

In awarding the Goddard Trophy, named for U.S. rocket pioneer Robert Goddard, the National Space Club cited Reagan "for his inspirational leadership and vision in establishing new national goals assuring the U.S. pre-eminence in the use of space for peace." Reagan is the second U.S. president to receive the trophy since it was first awarded in 1958 to Dr. Werner von Braun. President Lyndon B. Johnson received the award in 1966.

Reagan also named outgoing U.N. Ambassador Jeane Kirkpatrick to the commission, as well as Apollo 11 Commander Neil Armstrong and Air Force Brig. Gen. Chuck Yeager. Armstrong was the first man to walk on the Moon, and Yeager the first person to break the sound barrier.

Other members of the commission are:

General Bernard A. Schriever (Ret.), former Commander of Systems Command for the Air Force.

Laurel Wilkening, 40, vice provost of the University of Arizona and a former NASA scientist. Wilkening will serve as vice chairman of the commission;

Luis Alvarez, 73, a physicist at the Lawrence Berkeley Laboratory in California;

Paul Coleman, 53, President of the Space Research Association and professor of geophysics and space at the University of California at Los Angeles;

George Field, 55, senior physicist at the Smithsonian Astrophysical Observatory and a professor of astronomy at Harvard University;

Retired Marine Gen. William Fitch, 55, former deputy chief of staff for Marine aviation;

Charles Herzfeld, 59, vice president and director of research and technology with ITT Corp.;

J. L. Kerrebrock, 57, head of the Department of Aeronautics and Astronautics at the Massachusetts Institute of Technology;

Gerard K. O'Neill, 58, President of Geostar Corp. in Princeton, New Jersey and popularizer of the "High Frontier" studies of the 1970s for space colonies and utilizaton of space resources;

David Webb, 56, a space consultant and founding member of the National Coordinating Committee for Space.

NASA Mathematician Presented High Honors

David R. Hedgley, a research mathematician at NASA's Ames-Dryden Flight Research Facility, Edwards California has been presented the H. Julian Allen Award for solving a computer problem that has baffled other computer experts. The award and its corresponding honorarium were given to Hedgley in conjunction with the presentation of his paper, "A General Solution to the Hidden-Line Problem," in ceremonies officiated by Ames Director William F. Ballhaus, Jr., at Moffett Field.

This was the third major award that Hedgley has received recognizing his efforts in developing a solution to the computer graphics hidden line problem. Hedgley received the National Aeronautics and Space Administration's Space Act Award recently, as well as the NASA Exceptional Engineering Achievement Medal in December 1983.

The H. Julian Allen Award was established in 1969 to recognize outstanding scientific and engineering papers authored by members of the Ames Research Center staff. The award is presented annually with an honorarium, for the best paper as judged by the Selection Committee.

While being recognized officially, the Hedgley solution breakthrough is speaking for itself in industry, government and in the universities. COSMIC, the Computer Software Management and Information Center at the University of Georgia, which distributes NASA computer programs to other agencies and the private sector, reports that the Hedgley program has in its first

LIBRARY
EASTERN MICHIGAN UNIVERSITY
YPSILANTI
U. S. DEPOSITORY DOCUMENT

year, outsold all programs that COSMIC has offered since it began in 1966. Reports from users of the program praise its ease of application and its speed in portraying three-dimensional opaque objects in perspective without the complicating and ambiguous "hidden lines" found in conventional programs. They also cite considerable engineering and design cost savings.

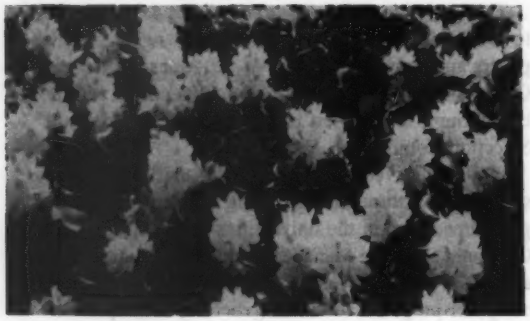
Hedgley is the first Ames Dryden employee to be recognized with the Allen award. The honorarium associated with the award was $5,000.

The Water Hyacinth Has a New Image

The water hyacinth, long fought as a weed that clogged streams and lakes, is destined to become a force in the battle against water pollution as a result of research conducted by the National Aeronautics and Space Administration.

Because of their beautiful lavender flowers, the water hyacinth was brought to this country by Japanese exhibitors in 1884, as part of the New Orleans Cotton States Exposition. The plants were given away as souvenirs and when many were thrown away in drainage canals, streams and swamps, the trouble soon began. Due to the lack of insects which controlled the water hyacinth's growth in its native environment, the plant grew at an explosive rate.

NASA studies now show that the water hyacinth, when used under controlled conditions, is ideally suited for purifying domestic as well as certain industrial wastewaters. They can be harvested and ground into fertilizers, used to produce biogas and fiber, and can be harnessed to produce large quantities of fresh water.



The water hyacinth has a positive future.

NASA's research into the potential benefits of the water hyacinth has been led by Dr. Billy C. Wolverton, Ph.D., a senior research scientist, and Rebecca C. McDonald, a research chemist, at NASA's National Space Technology Laboratories, Bay St. Louis., Miss.

The water hyacinth also shows promise for partially supplying life sustaining functions for space travel, including oxygen, food, pure water and waste treatment. These functions of the water hyacinth could be useful on the NASA Space Station.

For the past 11 years, the water hyacinth has been tested at NASA's NSTL as an inexpensive method of treating wastewater. The vascular aquatic plants used in the early studies were floating species. This research led to the installation of a simple and cost effective wastewater treatment system at NSTL and development communities in Florida, Texas and California.

NASA recently developed an advanced natural wastewater process that combines anaerobic microbial filter technology with the vascular plant wastewater treatment technology to produce an efficient hybrid system. This system uses rooted, cold-tolerant plants such as common reed growing on the surface of a microbial rock filter bed. The filter reed system has advantages over the floating aquatic system because wastewater is exposed to the atmosphere only after treatment and higher chemical concentrations can be tolerated because of the high surface microbial filter. Although the system was developed for domestic sewage, it has shown a potential for chemical waste and drinking water treatment.

One of the most important chemicals in use today is phenol. It is used to manufacture phenolic resins, epoxy resins, herbicides and nylon. It is also an important industrial and pharmaceutical solvent. Recent concerns about the discharge of large quantities of the chemical into the Mississippi River north of New Orleans and subsequent contamination of the city's drinking water demonstrated the need for efficient, inexpensive means of removing phenol and other toxic chemicals from contaminated drinking water. NASA's advanced natural wastewater treatment process was tested successfully in meeting this challenge.

Thanks to NASA research, the dreaded water hyacinth is forming a new image. Instead of the uncontrollable aquatic monster it has been for a hundred years, it is now emerging as an ideal candidate for large scale nutrient removal and water purification systems. The water hyacinth promises to aid mankind in meeting its most basic problems of sustaining an acceptable quality of life here on Earth and also in the remoteness of space.

Industry and Government

Each year, approximately 10 successful federal people spend 1 year on an assignment in the private sector. Similarly, there are approximately 30 executives of the same caliber selected from industry for a 1-year (September to September) assignment in federal agencies.

Termed the President's Executive Exchange Program (PEEP) the program promotes mutual understanding between the federal and private sectors, fosters new and challenging experiences, and stimulates ideas and promotes techniques which result in better management and greater cooperation. The aim of the program is to develop a cadre of experienced executives who will contribute unique insights and judgement in their policy-making positions.

In 1983-84, NASA had three PEEP interchanges, one from NASA and two from industry.

For the 1984-85 program, NASA is hosting two industry executives: Linda Long and David Greulich.

Linda Ann Long, Area Director, Public Affairs for Gulf Oil Corporation is serving as Executive Assistant to the Director for Public Affairs, NASA Headquarters, Washington, D.C.

She coordinates the activities of the Director of Public Affairs' staff and oversees the development of the Division's operating and 5-year strategic plans.

At Gulf, she handled government, media and community relations for a four state region. Prior to joining Gulf, Miss Long worked as Legislative Liaison to the General Assembly for Delaware Governor Pierre S. duPont, IV.

David Greulich, a marketing executive from Cabot Corporation, is assigned to the Customer Services Division and reports as a Special Assistant to the Associate Administrator for Space Flight, NASA Headquarters, Washington, D.C.

Dave, who has a broad background in industrial and military marketing and marketing management, is assigned the task of bringing private enterprise selling methods into the Shuttle program and the NASA system.

Another program that brings industry and government together is the White House Fellowship Program.

The purpose of this program is to provide talented people from the private sector with a 1-year firsthand experience in the process of the Federal Government, utilizing their abilities and developing their skills in the broadest sense possible.

The aim is to develop a cadre of business and professional people who can share their new knowledge and contribute to society more ably and productively through a fuller understanding of the Federal Government.

Teresa Smith, one of the 13 1984-85 White House Fellows, is serving as a Special Assistant to NASA Administrator James M. Beggs. For the first part of her year, Teresa was appointed as the Acting Director of the newly formed Educational Affairs Division. In this role, her charter was to develop a strong management infrastructure for the new organization. Her responsibilities included over-seeing three departments — Elementary and Secondary Education, Publications, and University Affairs. She directed the new NASA Operation Liftoff Program (a Presidential initiative intended to promote math and science education at the elementary level) and worked with the White House Young Astronaut Program.

For the second half of her year, Teresa is working in the area of NASA-DOD Affairs. Her role is to ensure that NASA-DOD management keep abreast of each other's activities on a continuing basis. She is currently heading a panel which is working toward establishing a series of DOD technology briefings for NASA Headquarters management.

Prior to her fellowship, Teresa was with the Westinghouse Advanced Technology Labs in Baltimore. She was a Program Manager on the DOD Very High Speed Integrated Circuits (VHSIC) effort. Teresa holds a B.S.E.E. from Johns Hopkins University and has done graduate work in solid state engineering.

Space Station Agreement Signed With Canada

NASA Administrator James M. Beggs and Canadian Minister of Science and Technology, The Honorable Tom Sidden, have signed a memorandum of understanding for the conduct of a cooperative program concerning detailed definition and preliminary design (Phase B) of a permanently manned Space Station.

Administrator Beggs said, "We are pleased that Canada has become an international partner in the definition and preliminary design phase of the Space Station's development. We look forward to working with our friends in Canada, Europe and Japan in building a firm foundation for future cooperation on a permanently manned Space Station to serve the needs of the Free World in developing the peaceful uses of space well into the next century."

Under the memorandum, the United States and Canada will conduct and coordinate parallel Phase B studies. The agreement provides for interaction and information exchange during the next 2 years. Canada, which has approved $8.8 million for the first year of Phase B, will study a space construction and servicing system; a solar array for a platform or as a potential auxiliary power source for Space Station; and a remote sensing facility.

NASA has entered into similar agreements with the European Space Agency (ESA) and Japan.

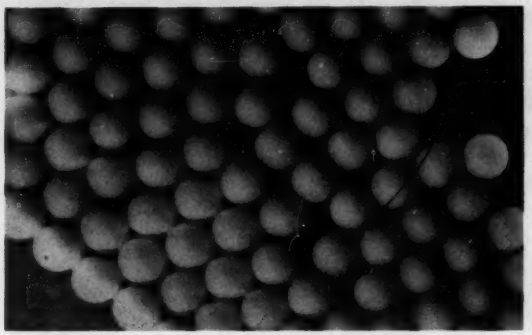
Cooperation during the development, operations and utilization phases will require separate agreement.

NASA Inventors of the Year Announced

The National Aeronautics and Space Administration presented its 1984 Inventor of the Year Award to Dale M. Kornfeld of Marshall Space Flight Center, Huntsville, Ala., and John W. Vanderhoff, Mohammed S. El-Asser and Fortunato J. Micale, all of Lehigh University, Bethlehem, Pa. The inventors were honored for their "Process for Preparation of Large-Particle Size Monodisperse Latexes."

At a ceremony at NASA Headquarters in Washington, D.C., the inventors were presented an Inventor of the Year plaque and certificate, a Space Act Award certificate and a monetary award. Kornfeld and Vanderhoff each received $2,500; El-Asser and Micale, $2,000. Edward Sudol, Chi-Ming Tseng and Anthony Silwanowicz, also of Lehigh, will each receive a $2,000 Space Act Award. These three were contributors but not considered as inventors.

The Monodisperse Latex Reactor processor, an experiment flown aboard the Space Shuttle, has produced microspheres in zero gravity in sizes ranging from 5 to 30 micrometers. The maximum size particles that can be produced on Earth, with the required standards of quality and uniformity, is about 2 to 3 micrometers.



Latex beads magnified 1000 times.

Microspheres can be used in calibrating sensitive scientific instruments such as microscopes, filters and particle counters. Medical uses include identification of cancer and glaucoma and the study of the transport of materials inside living organisms. Industrial applications include the production of finely-ground products such as paint pigments, inks, toners, explosives and other powder materials.

In July 1984, a major step was taken toward making the microspheres commercially available, when NASA presented 15 grams of 10-micrometer particles to the Commerce Department's National Bureau of Standards (NBS). NBS will certify the microspheres as "standard reference material" and make them available to purchasers.

NASA has submitted the names of the four inventors to the Intellectual Property Owners, Inc. (IPO) as nominees for national recognition. IPO, in cooperation with the U.S. Patent and Trademark Office, conducts National Inventor of the Year competition.

In 1978, Barbara Askins, also of Marshall, was selected as the National Inventor of the Year for her invention of a practical autoradiographic image enhancement process.

Earlier this year, Philip A. Studer of Goddard Space Flight Center, Greenbelt, Md., was presented the NASA 1983 Inventor of the Year Award for his invention of a linear magnetic bearing.

Report Cites Need for Automation in Space Station

NASA Headquarters Space Station automation study has shown that automation and robotics promise to be a significant element of the NASA Space Station program and that the initial Space Station should be designed to accommodate evolution and growth in these areas.

Recommendation for automation and robotics development are contained in a report by the NASA Advanced Technology Advisory Committee (ATAC) recently submitted to the U.S. Congress. (The ATAC report is required under Public Law 98-371 which appropriated Fiscal Year 1985 funds for NASA.)

The report notes that because automation and robotics are so important, all Space Station elements, including the core station and associated unmanned platforms, vehicles and ground facilities, are candidates for these technologies. The advisory committee believes that much greater use of automation and robotics technology could be made if research and development were accelerated in an augmented program.

The Automation and Robotics Panel, which assisted the advisory committee in a 6-month study led by the California Space Institute on the subject, stated that a desired level of funding for automation and robotics research is 13 percent of the total Space Station costs and that a minimum acceptable level is 7 percent.

The augmented program would result in somewhat greater productivity from the initial station and much greater productivity from later versions of the station.

In addition to the recommendations that automation and robotics be a significant element of the Space Station program and that the station be designed for evolution and growth in those uses, the advisory committee report recommended:

— The initial Space Station should utilize significant elements of automation and robotics technology.

— Criteria for the incorporation of automation and robotics technology should be developed and promulgated.

— Verification of the performance of automated equipment should be stressed, including terrestrial and space demonstrations to validate technology for Space Station use.

— Maximum use should be made of technology developed for industry and government.

— The techniques of automation should be used to enhance NASA's management capability.

— NASA should provide the measures and assessments to verify the inclusion of automation and robotics in the Space Station.

— An evolutionary station should achieve, in stages, a very high level of advanced automation.

— An aggressive program of long-range technology advancement should be pursued, recognizing areas in which NASA must lead, provide leverage for, or exploit developments.

— A vigorous program of technology transfer to U.S. industries and research and development communities should be pursued.

— Satellites and their payloads accessible from the Space Station should be designed, as far as possible, to be serviced and repaired by robots.

NASA will incorporate the recommendations of the ATAC report into the Phase B definition and preliminary design contracts the agency is negotiating with industry teams. Work on these contracts began in April.

The report also stated that the successful incorporation of automation and robotics by the Space Station program could lead to the deployment of a new generation of flexible and adaptable space systems. These systems could provide the United States with important new methods of generating and exploiting space knowledge in commercial enterprises and thereby help preserve U.S. leadership in space and industrial systems.

The Advanced Technology Advisory Committee will continue to follow A&R needs and report to Congress semi-annually.

The advisory committee is made up of personnel from NASA Headquarters and NASA Centers. Chairman is Aaron Cohen, Director of Research and Engineering at the Johnson Space Center, Houston. The Automation and Robotics Panel is chaired by James R. Arnold of California Space Institute (Cal Space), University of California, and its membership includes both NASA and non-NASA people.

The NASA automation study was directed by Daniel H. Herman, Director of the Engineering Division, Office of Space Station, NASA Headquarters, Washington, D.C. and Victor J. Anselmo, Herman's deputy for automation.

Evidence Found Supporting Mineral Origin of Life Theory

A discovery by NASA scientists has provided additional support for an emerging theory about the origin of life on Earth. The theory is that organic life did not arise from an accidental combination of chemicals and energy in a primordial "soup" on the primitive Earth, but from a combination of chemicals that were selected and combined in an orderly process found in ordinary ceramic clay.

Basic to this theory are recent scientific observations which suggest that clay, although composed of inorganic material, nevertheless exhibits life-like characteristics in its ability to select out certain chemicals and to serve as a catalyst of chemical reactions. Some scientists have theorized that clay also may be able to perform additional chemical functions basic to life including self-replication, growth and transfer of chemical information to other chemical systems.

Many scientists are reluctant to accept this theory about the ability of clay to perform these chemical functions. Nevertheless, even the strongest skeptics believe it deserves further investigation.

According to the clay origin-of-life theory, organic chemicals that eventually "learned" to reproduce themselves and create life could have come together in an orderly process which first appeared in the structuring and reproductive processes attributed to clay.

The NASA work that strengthens the theory is a finding that clay has the ability to absorb, store and transfer energy which is a necessary process of organic life.

The clay-energy storage and transfer processes were discovered by a group of researchers led by Dr. Lelia Coyne of San Jose State University, working at NASA's Ames Research Center, Mountain View, Calif.

According to the new origin-of-life theory which is attributed to A.G. Cairns-Smith of the University of Glascow, Scotland, clay minerals served as inorganic proto-organisms which were the forerunners of later organisms based on organic compounds. This "clay-life" theory is a major departure from previous origin-of-life theories. These theories propose that the very first proto-organisms formed at random from an array of organic raw materials.

The revised new theory further proposes that inorganic proto-organisms were not only precursors of organic life but also may have provided a transitional evolutionary structure for it. That is, the theory suggests that synthesis of later living organisms based on organic compounds was initially directed by an original inorganic pattern.

The NASA-Ames discovery of energy storage and transfer in clays introduces a new and important aspect to the clay-life theory — in addition to clay's long-known ability to act as a catalyst and its suggested potential for self-replication.

The new evidence shows that clay minerals are capable of engaging in energetic processes which are necessary conditions if it is to be shown that clays have lifelike properties.

This current NASA-sponsored investigation with clays grows out of 20 years of research involvement of Ames scientists in studies of the chemical basis for the origin of life. Scientists besides Coyne recently involved in various aspects of clay research at Ames include Drs. Sherwood Chang, Ted Bunch, James Lawless, Noam Lahav, David White, and Glenn Pollock.

Gas Cloud Surrounds Possible Protoplanetary System

Observations with the International Ultraviolet Explorer (IUE) satellite have revealed what appears to be a variable cloud of gas surrounding the star Beta Pictoris, a star that many astronomers think is a leading candidate for a planetary system resembling our own.

Beta Pictoris is located in the constellation Pictor in the southern hemisphere.

Large particles of dust have been reported previously from observations using the Infrared Astronomy Satellite (IRAS) and ground-based telescopes.

The IUE findings of co-existing dust and gas clouds are consistent with scientific theories of planetary system formation, according to Dr. Yoji Kondo, IUE project scientist at the Goddard Space Flight Center in Greenbelt, Md., and Dr. F. C. Bruhweiler of Catholic University, Washington, D.C.

Many stars like Beta Pictoris show evidence of being surrounded by clouds of gas at ultraviolet wavelengths and if such data implies that these stars also are surrounded by a protoplanetary gaseous cloud with a disk of dust particles, then many nearby stars may have evolving planetary systems. These stars would offer a unique opportunity to see the way a solar system might appear in formation.

In general, theories predict that planets evolve from large stellar clouds of dust and gas which gradually condense into orbiting planetary bodies.

This theoretical argument for planet formation was strengthened 2 years ago by observations with the IRAS, an international infrared satellite in Earth orbit, which suggested that a number of nearby stars are surrounded by planetary disks.

Additionally, astronometric measurements of the movement of several stars have indicated the possible presence about each star of a planetary body several times more massive than Jupiter.

IRAS detected evidence of the presence of particles larger than 1 millimeter surrounding a star similar to Beta Pictoris. In October, ground observations of Beta Pictoris indicated the presence of dust particles of sizes larger than a fraction of a millimeter which could engulf possible planetary bodies. The ground observations, were made from the Andes Mountains by Drs. Bradford Smith, University of Arizona, and Richard Terrile, of NASA's Jet Propulsion Laboratory, Pasadena, Calif., using an image-enhanced near-infrared telescope.

Kondo and Bruhweiler used the IUE telescope to obtain the ultraviolet spectra of Beta Pictoris to determine the manner in which ultraviolet light was absorbed by the gas cloud and the extinction of the light by the dust cloud. The ultraviolet spectra showed an absence of selective extinction of the light at shorter wavelengths, evidence that the star's light was being blocked evenly at all wavelengths by dust particles greater than 1 micron (millionth of a meter), as reported from infrared data.

The IUE observations indicate that the gas was either clumpy or varying under the pressure of the stellar wind and radiation. If so, this would tend to complement IRAS and ground telescope observations that a substantial dust cloud of protoplanetary material exists around Beta Pictoris.

Kondo and Bruhweiler caution that there is an alternate possibility that the lack of observed extinction could be due to viewing the star just a little off-plane, so that the telescope's line-of-sight was not aligned directly through the disk of orbiting dusty matter.

However, Bruhweiler feels that would be unlikely. Evidence seems to point to a belt too thick around Beta pictoris for the line-of-sight to be missing the dust belt. The existence of such a thick dust belt is supported by the work of Smith and Terrile indicating that the star's radiation is dimmed by half a magnitude due to dust obscuration.

Aerospace Research Aid Developed by NASA

A 5-year project to improve aircraft research techniques at NASA Lewis Research Center, Cleveland, has resulted in the development of a low-cost, easily programmed computing system that stimulates or monitors complex physical processes in real time.

The new Real-Time Multiprocessor Simulator, for example, could save airplane and helicopter engine producers considerable sums in the development and testing processes.

Real-time simulators are particularly important in studying the internal aerodynamics of a jet engine. Variables include the performance of turbine and convergent-divergent nozzles, bypass valves, injectors, and fan and compressor geometry. These variables must be coordinated with fuel flows and flight controls. In accomplishing the real-time simulation of a helicopter engine, the NASA system solves all 63 engine equations within one one-hundredth of a second.

The new system has hundreds of other important real-time applications in which there is a critical need to simulate or monitor many processes at once, or when the reaction of one process can be vital to the performance of another. For example, such a system could monitor the structural dynamics of a space station at several locations, with a processor dedicated to each location.

The essence of the NASA system is a network of computers tied together and operating simultaneously but with different programs, each one a portion of the overall task. Using the NASA system, one aspect of a dynamic process can be changed so that the system can compute and report on the effect of that change on other parts of the process.

Using state-of-the-art high-performance microcomputers, NASA scientists have designed hardware configurations that enable one person at a single terminal to control up to 10 microcomputers operating simultaneously, each handling a portion of a total program.

In addition to developing the new simulation hardware, NASA scientists have also developed a companion form of computer language, taken from the PASCAL format, that enables an engineer who is not a computer specialist to program his own multiprocessor for experimentation or monitoring. The programming language has been designed to be generic so that a variety of computer codes and tasks can be developed.

John R. Szuch, assistant chief of the Altitude Wind Tunnel Systems Office at the Lewis Research

Center, Cleveland, Ohio, has been part of this project from its beginning and has stated the next task for the real-time simulation system will be a variety of applications in the Lewis wind tunnel. The study of turboprop engines under adverse weather conditions at a variety of altitudes and temperatures will take place in this 20-foot-diameter facility.

Contractor News

McDonnell Douglas Astronautics Co., a California division of McDonnell Douglas Corp., St. Louis, and **Rockwell International, Space Station Systems Division,** Downey, Calif. have been selected for fixed-price awards for definition and preliminary design (Phase B) of the structural framework and other elements of a permanently manned Space Station.

The contracts will be managed by NASA's Johnson Space Center, Houston. Work on the contracts will extend for 21 months.

The Johnson contracts will cover definition and preliminary design of the structural framework to which the various elements of the Space Station will be attached; interface between the Space Station and the Space Shuttle; mechanisms such as the remote manipulator systems; attitude control, thermal control, communications and data management systems; plan for equipping a module with sleeping quarters, wardroom and galley; and plan for extravehicular activity.

General Dynamics Corp., Convair Division, San Diego has been awarded a $58,291,440 contract by NASA's Lewis Research Center, Cleveland, Ohio, for three Centaur G vehicles to be used as upper stages on future Shuttle missions.

The sole-source/cost-plus-incentive-fee contract for fabrication, assembly, test, checkout and delivery of the three vehicles in April, and will continue through October 1987. Most of the work will be performed at the San Diego plant, with a smaller portion of the work being performed at the Eastern Space and Missile Center, Fla.

Centaur, the nation's most powerful upper stage vehicle, is being modified to fit into the Space Shuttle's payload bay to launch various large spacecraft including the Galileo mission to investigate Jupiter's atmosphere and satellites, and the Ulysses mission to study the polar regions of the Sun, both in the spring of 1986.

KMS Fusion Inc., Ann Arbor, Mich has been awarded a contract by NASA for the design and development of an instrument package that will measure forces encountered by the Shuttle.

The package is called the Orbital Acceleration Research Experiment (OARE) and it will measure the effect of aerodynamic drag on large space vehicles in low Earth orbit.

The data will enable NASA to determine the cumulative effect of aerodynamic drag on space vehicles that spend long periods in orbit. The information will be used to plan orbital corrections for the space station, planned for launch in the mid 1990s.

The initial OARE development contract calls for system design starting in early 1985, with construction and test phases leading to an acceptance test planned for spring of 1988. The program will be under contract to the Aerospace Technology Group of KMS Fusion.

Johnson Space Center, Houston, Tx., will be responsible for experiment implementation and installation, with Langley Research Center defining the scientific requirements.

Fairchild Control Systems Co. has been awarded a $1.8 million contract to develop a standardized coupling for refueling satellites in orbit. The coupling will handle fluids such as hydrazine, nitrogen tetroxide, trichlorotrifluoroethane, water, nitrogen and helium gases. The coupling is expected to be used initially with the Gamma Ray Observatory scheduled for launch in 1988.

Did You Know?

The Space Shuttle has carried more than 390,000 pounds of cargo into near-Earth orbit. Payloads have ranged from 260,000 postal covers to numerous scientific instruments and more than a dozen satellites. It would take a convoy of 10 tractor-trailers to carry as much cargo as the shuttle has in its first 15 flights, excluding military payloads.

The energy released by the three main engines of the Space Shuttle at full power levels is equivalent, in units of watts, to the output of 23 Hoover Dams. One main engine generates sufficient thrust to maintain the flight of two and one-half 747 airplanes.

Scheduled Shuttle Launches for 1985

Mission	Date/ Orbiter	Payloads	Crew
51-G	June 12, 1985 *Discovery*	Telestar 3-D Morelos-A Arabsat-1B Spartan-101 FEE/FPE	Brandenstein, CDR Creighton, PLT Lucid, MS Fabian, MS Nagel, MS Baudry, PS (France) Sultan Salman Abdelazize Al-Saud, PS (Saudi Arabia)
51-F	July 15, 1985 *Challenger*	Spacelab 2	Fullerton, CDR Bridges, PLT Musgrave, MS England, MS Henize, MS Acton, PS (Lockheed) Bartoe, PS (USN civilian)
51-I	Aug. 10, 1985 *Discovery*	Syncom IV-4 ASC-1 MSL-2 Aussat-1 CFES	Engle, CDR Covey, PLT van Hoften, MS Lounge, MS W. Fisher, MS Jarvis, PS (Hughes) Walker, PS (McDonnell Douglas)
51-J	Sept. 26, 1985 *Atlantis*	DOD	Bobko, CDR Grabe, PLT Hilmers, MS Stewart, MS
61-A	Oct. 16, 1985 *Columbia*	Spacelab-D1	Hartsfield, CDR Nagel, PLT Buchli, MS Bluford, MS Dunbar, MS Furrer, PS (DFVLR) Messerschmid, PS (DFVLR) Ockels, PS (ESA)
61-B	Nov. 8, 1985 *Challenger*	Morelos-B Satcom KU-1 Aussat-2 EOS-1	Shaw, CDR O'Connor, PLT Cleave, MS Spring, MS Ross, MS Morelos PS McDonnell Douglas PS
61-C	Dec. 20, 1985 *Columbia*	MSL-3 HS-376 Satcom KU-2 EASE/ACCESS	Gibson, CDR Bolden, PLT Chang-Diaz, MS Hawley, MS Nelson, MS RCA PS

Another Dividend from Air and Space

Research and development in aeronautics and space have provided numerous benefits for all Americans — and at a tiny percentage of the tax dollar. Here is an example:

Cool Sportswear

A new line of athletic wear has been introduced by Techni-Clothes, Inc. of New York City, headed by Dr. Lawrence H. Kuznetz, bioengineer and physiologist at the Johnson Space Center, Houston, Texas. Kuznetz's work has lead to the development of the latest in space-spinoff apparel.

With the help of some JSC colleagues, Kuznetz has developed a number of commercial products based on his space expertise, in particular his experience in designing circulating liquid cooling systems for astronauts' space suits.

Techni-Clothes' initial line is a series of items for cooling athletes, allowing them to perform more strenuous activity without becoming overheated. Like the space suit, the apparel is designed to remove heat by the circulating liquid method, which would have been too cumbersome for sports use. Instead, the gear incorporates packets containing a heat-absorbing gel, a more efficient version of the "blue-ice" sold for use in picnic coolers. The gel packet slips into an insulated pocket of the athletic garment (above) and is positioned near parts of the body where heat transfer is most efficient — for example, the forehead, neck or wrist. A gel packet is good for about an hour; it can be replaced from a supply of spares in an insulated container worn on the belt.

The company's line also includes wrist bands and running shorts with gel-pack pockets. The products are targeted primarily for the estimated 25 million runners and joggers in the U.S., but they can be used by any athlete whose performance may be affected by hot weather.

The photo below illustrates still another Kuznetz product, also a space spinoff but based on somewhat different technology. In this application, Kuznetz employed materials technology and systems engineering techniques to design a bra for female runners and joggers. Called the Support-Her Bra, it is manufactured by Protogs Inc., Hicksville,* New York. The halter-like garment, made of a knit interlining and a nylon mesh outer shell, is a carefully engineered restraint and support device intended to prevent shoulder and back strains, abrasions and other problems encountered by women runners. Kuznetz and his associates have designed several other space spinoff products, including special purpose clothing, survival gear and medical rehabilitation devices.

* NASA does not endorse commercial products developed as a result of its Technology Utilization or Patent Licensing Programs, but it does encourage the widest possible use of its technology.